

## **Amendments to the Claims:**

### **Listing of Claims:**

1. (Currently Amended) A publish/subscribe messaging system, comprising:  
at least one broker and at least one subscriber, wherein the at least one broker has means for sending a status request message to the at least one subscriber,  
means, responsive to ~~[[each]]~~a particular subscriber receiving the status request message from the at least one broker, for setting a timer for ~~[[each]]~~the particular subscriber of the at least one subscriber, and  
means, responsive to the timer expiring, for sending a multicast message claiming response to the at least one broker from ~~[[a]]~~the particular subscriber of the at least one subscriber.
2. (Previously Presented) The publish/subscribe messaging system of claim 1, further comprising:  
means for sending a status response message from the particular subscriber to the at least one broker, wherein the status response message is an indication of liveness of the at least one subscriber.
3. (Previously Presented) The publish/subscribe messaging system of claim 1, further comprising:  
means for listening on a multicast channel by the at least one broker, and  
means for determining an indication of non-liveness from failure to receive a response from the at least one subscriber.
4. (Previously Presented) The publish/subscribe messaging system of claim 2, wherein the means for sending the status response message from the particular subscriber to the at least one broker further comprises:

means, responsive to the particular subscriber sending the status response message, for suppressing sending of a separate status response message from another subscriber of the at least one subscriber.

5. (Currently Amended) The publish/subscribe messaging system of claim 4, wherein sending the status response message is responsive to sending the multicast message claiming response, and wherein the means for suppressing further comprises:

means, responsive to the another subscriber of the least one subscriber receiving the multicast message claiming response, for cancelling the timer and discarding the status request message for the another subscriber.

6. (Previously Presented) The publish/subscribe messaging system of claim 5, further comprising:

means, responsive to the at least one broker failing to receive the multicast message claiming response from the at least one subscriber, for re-sending the status request message.

7. (Previously Presented) The publish/subscribe messaging system of claim 4, wherein the means for suppressing further comprises:

means, responsive to a desired plurality of subscribers of the at least one subscriber sending the status response message, for suppressing sending of the separate status response message from the another subscriber.

8. (Previously Presented) The publish/subscribe messaging system of claim 7, wherein the status request message comprises a parameter representative of the desired plurality of subscribers, wherein sending the status response message is responsive to sending the multicast message claiming response, and wherein the means for suppressing sending of the separate status response message from the another subscriber further comprises:

means, responsive to the another particular subscriber receiving the multicast message claiming response from the desired plurality of subscribers, for cancelling the timer and discarding the status request message for the another particular subscriber.

9. (Previously Presented) The publish/subscribe messaging system of claim 1, wherein the timer has a random duration.

10. (Previously Presented) The publish/subscribe messaging system of claim 1, further comprising:

means for maintaining an active connection between the particular subscriber and the at least one broker, wherein the active connection is established during registration, and

means for indicating liveness to the at least one broker using the active connection.

11. (Previously Presented) The publish/subscribe messaging system of claim 10, further comprising:

means for sending a status response message from the particular subscriber to the at least one broker to indicate the liveness,

means, responsive to the particular subscriber sending the status response message, for suppressing sending of a separate status response message from another subscriber, and wherein the means for suppressing further comprises:

means, responsive to determining that the particular subscriber has the active connection to the at least one broker, for performing one of sending the status response message to the at least one broker via the active connection, and sending the multicast message claiming response and the status response message to the at least one broker via the active connection upon expiry of the timer.

12. (Previously Presented) The publish/subscribe messaging system according to claim 1, wherein the at least one broker is arranged to designate a first subscriber to register interest in a topic as a primary subscriber, and to maintain an active connection to the primary subscriber for sending the status request message directly to the primary subscriber to designate a different subscriber as a new primary subscriber in response to a failure of the primary subscriber to send an indication of liveness and in response to the different subscriber sending the indication of liveness.

13. (Previously Presented) The publish/subscribe messaging system of claim 10, wherein the active connection is a transmission control protocol/internet protocol connection.
14. (Previously Presented) The publish/subscribe messaging system of claim 1, wherein the status request message is piggybacked onto another multicast publication message.
15. (Previously Presented) The publish/subscribe messaging system of claim 2, wherein the indication of liveness is sent over one of a user datagram protocol connection and a transmission control protocol connection.
16. (Previously Presented) The publish/subscribe messaging system of claim 15, wherein a connection over which the indication of liveness is sent is arranged to escalate autonomously from the user datagram protocol connection to the transmission control protocol connection in response to an absence of responses to the at least one broker within a chosen time period.
17. (Currently Amended) A method for liveness monitoring in a publish/subscribe messaging system having at least one broker and at least one subscriber, the method comprising:  
    sending a status request message from the at least one broker to the at least one subscriber,  
    responsive to [[each]]a particular subscriber receiving the status request message from the at least one broker, setting a timer for [[each]]the particular subscriber of the at least one subscriber, and  
    responsive to the timer expiring, sending a multicast message claiming response to the at least one broker from [[a]]the particular subscriber of the at least one subscriber.
18. (Previously Presented) The method of claim 17, further comprising:  
    sending a status response message from the particular subscriber to the at least one broker, wherein the status response message is an indication of liveness of the at least one subscriber.

19. (Previously Presented) The method of claim 17, further comprising:  
listening on a multicast channel by the at least one broker, and  
determining an indication of non-liveness from failure to receive a response from the at least one subscriber.
20. (Previously Presented) The method of claim 18, wherein sending the status response message from the particular subscriber to the at least one broker further comprises:  
responsive to the particular subscriber sending the status response message, suppressing sending of a separate status response message from another subscriber of the at least one subscriber.
21. (Previously Presented) The method of claim 20, wherein sending the status response message is responsive to sending the multicast message claiming response, and wherein the suppressing further comprises:  
responsive to the another subscriber of the least one subscriber receiving the multicast message claiming response, cancelling the timer and discarding the status request message for the another subscriber.
22. (Previously Presented) The method of claim 21, further comprising:  
responsive to the at least one broker failing to receive the multicast message claiming response from the at least one subscriber, re-sending the status request message.
23. (Previously Presented) The method of claim 20, wherein the suppressing further comprises:  
responsive to a desired plurality of subscribers of the at least one subscriber sending the status response message, suppressing sending of the separate status response message from the another subscriber.
24. (Previously Presented) The method of claim 23, wherein the status request message comprises a parameter representative of the desired plurality of subscribers, wherein sending the status response message is responsive to sending the multicast message claiming response, and

wherein suppressing sending of the separate status response message from the another subscriber further comprises:

responsive to the another particular subscriber receiving the multicast message claiming response from the desired plurality of subscribers, cancelling the timer and discarding the status request message for the another particular subscriber.

25. (Previously Presented) The method of claim 17, wherein the timer has a random duration.

26. (Previously Presented) The method of claim 17, further comprising:

maintaining an active connection between the particular subscriber and the at least one broker, wherein the active connection is established during registration,  
indicating liveness to the at least one broker using the active connection.

27. (Previously Presented) The method of claim 26, further comprising:

sending a status response message from the particular subscriber to the at least one broker to indicate the liveness,

responsive to the particular subscriber sending the status response message, suppressing sending of a separate status response message from another subscriber of the at least one subscriber, and wherein the suppressing further comprises:

responsive to determining that the particular subscriber has the active connection to the at least one broker, performing one of sending the status response message to the at least one broker via the active connection, and sending the multicast message claiming response and the status response message to the at least one broker via the active connection upon expiry of the timer.

28. (Previously Presented) The method of claim 17, further comprising:

a first subscriber of the at least one subscriber to register interest in a topic as a primary subscriber, maintaining an active connection to the primary subscriber for sending the status request message directly to the primary subscriber, and

responsive to a failure of the primary subscriber to send an indication of liveness and responsive to a different subscriber of the at least one subscriber sending the indication of liveness, designating the different subscriber as a new primary subscriber.

29. (Previously Presented) The method of claim 26, wherein the active connection is a transmission control protocol/internet protocol connection.

30. (Previously Presented) The method of claim 17, wherein the status request message is piggybacked onto another multicast publication message.

31. (Previously Presented) The method of claim 18, wherein the indication of liveness is sent over one of a user datagram protocol connection and a transmission control protocol connection.

32. (Previously Presented) The method of claim 31, wherein a connection over which the indication of liveness is sent escalates autonomously from the user datagram protocol connection to the transmission control protocol connection in response to an absence of responses to the at least one broker within a chosen time period.

33.–35. (Cancelled)

36. (Currently Amended) A system for indicating liveness to a broker in a multicast publish/subscribe messaging system comprising the broker and a plurality of subscribers, the system comprising:

means, responsive to ~~[[each]]~~ a particular subscriber receiving a status request message from the broker, for setting a timer for each subscriber in the plurality of subscribers, and

means, responsive to the timer expiring, for sending a multicast message claiming response to the broker from ~~[[a]]~~ the particular subscriber in the plurality of subscribers.

37. (Previously Presented) The system of claim 36, further comprising:

means for sending a status response message from the particular subscriber to the broker, wherein the status response message is an indication of liveness of the plurality of subscribers

38. (Previously Presented) The system of claim 37, further comprising:  
means, responsive to the particular subscriber sending the status response message, for suppressing sending of a separate status response message from another subscriber in the plurality of subscribers.

39. (Previously Presented) The system of claim 38, wherein sending the status response message is responsive to sending the multicast message claiming response, and wherein the means for suppressing further comprises:  
means, responsive to the another subscriber in the plurality of subscribers receiving the multicast message claiming response, for cancelling the timer and discarding the status request message for the another subscriber.

40. (Previously Presented) The system of claim 38, wherein the means for suppressing further comprises:  
means, responsive to a desired plurality of subscribers of the at least one subscriber sending the status response message, for suppressing sending of the separate status response message from the another subscriber.

41. (Previously Presented) The system of claim 40, wherein the status request message comprises a parameter representative of the desired plurality of subscribers, wherein sending the status response message is responsive to sending the multicast message claiming response, and wherein the means for suppressing sending of the separate status response message from the another subscriber further comprises:  
means, responsive to the another particular subscriber receiving the multicast message claiming response from the desired plurality of subscribers, for cancelling the timer and discarding the status request message for the another particular subscriber.

42. (Previously Presented) The system of claim 36, further comprising:  
means for maintaining an active connection between the particular subscriber and the



broker, wherein the active connection is established during registration and means for indicating liveness to the broker using the active connection.

43. (Previously Presented) The system of claim 36, further comprising:

means for sending a status response message from the particular subscriber to the broker to indicate liveness,

means, responsive to the particular subscriber sending the status response message, for suppressing sending of a separate status response message from another subscriber, and wherein the means for suppressing further comprises:

means, responsive to determining that the particular subscriber has an active connection to the broker, for performing one of sending the status response message to the broker via the active connection, and sending the multicast message claiming response and the status response message to the broker via the active connection upon expiry of the timer.

44. (Currently Amended) A method for indicating liveness to a broker in a multicast publish/subscribe messaging system comprising the broker and a plurality of subscribers, the method comprising:

responsive to each subscriber receiving a status request message from the broker, setting a separate timer for each subscriber in the plurality of subscribers, and

responsive to [[the]]a timer of a particular subscriber in the plurality of subscribers expiring, sending a multicast message claiming response to the broker from [[a]]the particular subscriber in the plurality of subscribers.

45. (Previously Presented) The method of claim 44, further comprising:

sending a status response message from the particular subscriber to the broker, wherein the status response message is an indication of liveness of the plurality of subscribers.

46. (Previously Presented) The method of claim 45, comprising:

responsive to the particular subscriber sending the status response message, suppressing sending of a separate status response message from another subscriber in the plurality of subscribers.

47. (Currently Amended) The method of claim 46, wherein sending the status response message is responsive to sending the multicast message claiming response, and wherein the suppressing further comprises:

responsive to the another subscriber receiving the multicast message claiming response, cancelling the timer of the particular subscriber and discarding the status request message for the another subscriber.

48. (Previously Presented) The method of claim 46, wherein the suppressing further comprises:

responsive to a desired plurality of subscribers of the plurality of subscribers sending the status response message, suppressing sending of the separate status response message from the another subscriber.

49. (Currently Amended) The method of claim 48, wherein the status request message comprises a parameter representative of the desired plurality of subscribers, wherein sending the status response message is responsive to sending the multicast message claiming response, and wherein suppressing sending of the separate status response message from the another subscriber further comprises:

responsive to the another particular subscriber receiving the multicast message claiming response from the desired plurality of subscribers, cancelling the timer of the particular subscriber and discarding the status request message for the another particular subscriber.

50. (Previously Presented) The method of claim 44, further comprising:

maintaining an active connection between the particular subscriber and the broker, wherein the active connection is established during registration, and indicating liveness to the broker using the active connection.

51. (Previously Presented) The method of claim 50, further comprising:

sending a status response message from the particular subscriber to the broker to indicate the liveness, responsive to the particular subscriber sending the status response message,

suppressing sending of a separate status response message from another subscriber, and wherein the suppressing- further comprises:

responsive to determining that the particular subscriber has the active connection to the broker, performing one of sending the status response message to the broker via the active connection, and sending the multicast message claiming response and the status response message to the broker via the active connection upon expiry of the timer.

52. (Cancelled)

53. (Previously Presented) The method of claim 17, further comprising:

responsive to sending the multicast message claiming response and responsive to an absence of an active connection between the particular subscriber and the at least one broker, establishing the active connection to the at least one broker and sending a status response message to the at least one broker via the active connection.

54. (Previously Presented) The publish/subscribe messaging system of claim 1, further comprising:

responsive to sending the multicast message claiming response and responsive to an absence of an active connection between the particular subscriber and the at least one broker, establishing the active connection to the at least one broker and sending a status response message to the at least one broker via the active connection.